

Applicant: Kari Juppi et al.
Application No.: 10/597,175
Response to Office action mailed Oct. 16, 2008
Response filed November 14, 2008

Claim Listing

1–35. (cancelled)

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36. (currently amended) A method of improving runnability and allowing for shortened dryer section of a paper or board machine comprising the steps of:

after pressing a paper or board web in a press nip of a pressing section, drying a first side of the paper or board web by blowing air or other hot gas of a temperature of 250°C-700°C directly on to the first side of the paper or board web in a pre-impingement dryer in which impingement takes place directly against the paper or board web and not through a fabric;

within a maximum distance of 4 meters of the pre-impingement dryer, drying the second side of the paper or board web in a second impingement dryer with blowing air or other hot gas of a temperature of 250°C-700°C on two sides of a loop formed by a support fabric, wherein the loop is in the vertical direction longer than its machine-directional dimension and is arranged such that the support fabric remains on the side of the paper or board web opposite blowing air;

keeping the paper or board web attached to the support fabric using internal suction devices, which direct a suction effect to the paper web from inside the support fabric;

within a maximum distance of 4 meters of the second impingement dryer, drying the second side of the paper or board web in a first group of steam heated dryer cylinders;

contacting the web second side to a drying surface of a first dryer cylinder of the group of steam heated dryer cylinders having a temperature of approximately 80°C and up to 130°C, wherein said drying surface is the drying surface of the first group of steam heated dryer[[s]] cylinders to first contact the web; and

wherein the paper or board web is heated by the second impingement dryer to a temperature which deviates less than 15°C from the drying surface of [[a]] the first dryer cylinder of the first group of steam heated dryer cylinders.

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37. (new) The method of claim 36 wherein the press nip is a last press nip in the press section, and further comprising the step of using a draw difference from said last press nip of the press section to the first dryer cylinder below 2.9%.

38. (new) The method of claim 36 wherein the press nip is a last press nip in the press section, and further comprising the step of using a draw difference from said last press nip of the press section to the first dryer cylinder below 2.5%.

39. (new) The method of claim 36 wherein the paper or board web is dried to a content-moisture in the range of 48% to 54% in the second impingement dryer, and a fabric loop is employed in the second impingement dryer that is not common with the first group of steam heated dryer cylinders.

40. (new) The method of claim 36 wherein the paper or board web is dried to a content-moisture in the range of 52% to 57% in the second impingement dryer and a fabric loop is employed in the second impingement dryer which is common with the first group of steam heated dryer cylinders.

41. (new) The method of claim 36 wherein the paper or board web is dried to a content-moisture in the range of 56% to 65% in the second impingement dryer and a fabric loop is employed in the second impingement dryer which is common with the first group of steam heated dryer cylinders which has at least four dryer cylinders about which the loop formed by a support fabric is wrapped.

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42. (new) An arrangement in a paper or board machine comprising:
a pressing section;
a paper or board web having a first side and a second side opposite the first side;
a pre-impingement dryer connected to a source of blowing air or other hot gas of a temperature of 250° C–700° C, the pre-impingement dryer arranged to direct air or other hot gas from the source of blowing air or other hot gas against the first side of the paper or board web and not through a fabric;
wherein the paper or board web extends from the pressing section through the pre-impingement dryer;
a second impingement dryer connected to a source of blowing air or other hot gas of a temperature of 250° C–700° C, the second impingement dryer within a maximum distance of 4 meters of the pre-impingement dryer, and positioned about the second side of the paper or board web which is positioned on two sides of a loop formed by a support fabric, wherein the loop extends vertically a distance greater than the loop extends in a machine direction and the support fabric is arranged such that the support fabric is on the side of the paper or board web opposite the second impingement dryer;
a plurality of internal suction devices, positioned inside the loop formed by the support fabric so as to direct a suction effect to the paper or board web;
a first group of steam heated dryer cylinders connected to a source of heated steam within a maximum distance of 4 meters of the second impingement dryer;
wherein the second side of the web extends from the second impingement dryer to first contact the first group of steam heated dryer cylinders on a drying surface of a first dryer cylinder of the first group of steam heated dryer cylinders having a temperature of from approximately 80° C and up to 130° C;
wherein the paper or board web between the second impingement dryer and the drying surface of the first dryer cylinder has a temperature which is within 15° C of

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the temperature of the drying surface of the first dryer cylinder of the first group of steam heated dryer cylinders where the paper or board web is adjacent to the drying surface of the first dryer cylinder.

43. (new) The arrangement of claim 42 wherein the pre-impingement dryer has a first impingement length and the second impingement dryer has a second impingement length and a total impingement length is defined as the sum of the first impingement length and the second impingement length, and wherein the first impingement length is equal to or less than 50%, of the total impingement length.

44. (new) The arrangement of claim 43 wherein the first impingement length is 15–35% of the total impingement length.

45. (new) The arrangement of claim 42 wherein the pre-impingement dryer is straight and has an inclination from the horizontal of 0–60 degrees.

46. (new) The arrangement of claim 42 wherein the pressing section has a last nip, and associated with said last nip of the pressing section there is a loop formed by a transfer belt, wherein the pre-impingement dryer is set on the transfer belt.

47. (new) The arrangement of claim 42 wherein the second impingement dryer further comprises:

the loop formed by the support fabric having an inner side and an outer side; and
a plurality of rolls inside the loop formed by the support fabric supporting and leading
the paper or board web downwardly.

48. (new) The arrangement of claim 42 wherein the second impingement dryer defines a center line which deviates at most 35° from a perpendicular.

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49. (new) The arrangement of claim 42 wherein the pre-impingement dryer further comprises a steambox.

50. (new) The arrangement of claim 42 wherein the pre-impingement dryer is of the gas-operated type.

51. (new) The arrangement of claim 42 wherein the second impingement dryer further comprises a fabric loop that is not common with the first group of steam heated dryer cylinders.

52. (new) The arrangement of claim 42 wherein the second impingement dryer further comprises a fabric loop that is common with the first group of steam heated dryer cylinders, and wherein the first dryer group of steam heated dryer cylinders has a maximum of three dryer cylinders.

53. (new) The arrangement of claim 42 wherein the second impingement dryer further comprises a fabric loop that is common with the first group of steam heated dryer cylinders, and wherein the first group of steam heated dryer cylinders has four or more dryer cylinders.